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RESEARCH AND SYSTEMATIC OBSERVATION

Issues related to the Global Climate Observing System

Note by the secretariat

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I. INTRODUCTION

A. Mandate

1. The Conference of the Parties (COP), by its decision 14/CP.4, requested Parties to submit information on national plans and programmes in relation to their participation in global observing systems for climate, in the context of reporting on research and systematic observation, as an element of national communications from Parties included in Annex I to the Convention (Annex I Parties) and, as appropriate, from Parties not included in Annex I to the Convention (non-Annex I Parties) (FCCC/CP/1998/16/Add.1).

2. The COP requested the Subsidiary Body for Scientific and Technological Advice (SBSTA), in consultation with the agencies participating in the Climate Agenda, drawing *inter alia* on the information provided in the second national communications from Annex I Parties and, as appropriate, in the initial national communications from non-Annex I Parties, to inform the Conference of the Parties at its fifth session of developments regarding observational networks, difficulties encountered, *inter alia*, with respect to the needs of developing countries and options for financial support to reverse the decline in observational networks.

3. It also invited the agencies participating in the Climate Agenda, through the Global Climate Observing System (GCOS) secretariat, to initiate an intergovernmental process for addressing the priorities for action to improve global observing systems for climate in relation to the needs of the Convention and, in consultation with the Convention secretariat and other relevant organizations, for identifying immediate, medium-term and long-term options for financial support; and it requested the secretariat to report results to the Subsidiary Body for Scientific and Technological Advice at its tenth session.

4. The SBSTA, at its ninth session, invited the agencies participating in the Climate Agenda, in consultation with the Convention secretariat, to assess options for synthesizing national plans and programmes for systematic observation of the climate system, for example by drawing on the expertise of GCOS and/or using the roster of experts, and to report to the SBSTA at its eleventh session (FCCC/SBSTA/1998/9, para. 26 (c)).

5. The SBSTA, at its tenth session, invited the agencies participating in the Climate Agenda, through the GCOS secretariat, to report to the SBSTA at its eleventh session on their actions and plans, in accordance with decision 14/CP.4, including proposals to hold workshops and, in preparing to do so, to consult widely, including, *inter alia*, with the Convention secretariat, the Chairman of the Intergovernmental Panel on Climate Change (IPCC) and the Global Environment Facility (GEF). The SBSTA also recalled paragraphs 1 (e) and 5 of decision 2/CP.4 requesting the GEF to report to the COP on its activities with regard to providing funding to developing countries to build capacity for participation in systematic observational networks (FCCC/SBSTA/1999/6, para. 75 (c) and (e)).

B. Scope of the note

6. This note provides preliminary information in response to the above mandates. It contains information on observational networks as provided by Annex I Parties in their second national communications, including, in some cases, information on support for capacity-building in developing countries. Information on the status of observational networks as provided by Parties not included in Annex I to the Convention is provided in document FCCC/SBI/1999/11. The GCOS secretariat also provided information, particularly with respect to the operation of surface and upper air networks and ocean observation networks in different regions. The information represents an initial step in understanding the current status of support for observational networks and is suggestive of broad areas needing improvements. Given the preliminary nature of the information, specific options for funding are not included in the note.

C. Possible action by the SBSTA

7. The SBSTA may wish to consider the information in this note and the need for any further activities. For example, it may wish to consider a process, in cooperation with the GCOS, for identifying the specific needs and resource requirements of developing countries, perhaps through a series of regional implementation meetings. It may also wish to provide additional guidance to the secretariat on this issue.

II. INFORMATION RELEVANT TO THE MANDATES

A. Developments regarding observational networks, including difficulties encountered and options for financial support

Information from national communications

8. Twenty-five Parties included in Annex I to the Convention have reported on research and systematic observation within their second national communications[1] (see the annex[2] to this document). The scope, coverage and level of detail vary considerably, making comparisons difficult. Of these, 23 Parties have reported at varying levels of coverage on data monitoring, collection and archives. Some of these national programmes feed directly into the international

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[1] The Parties that have provided information include: Australia, Austria, Canada, the Czech Republic, Denmark, the European Economic Community, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Latvia, the Netherlands, New Zealand, Norway, Portugal, Romania, the Russian Federation, Sweden, Switzerland, the United Kingdom of Great Britain and Northern Ireland, and the United States of America.

[2] The annex represents a synthesis of information contained in the second national communications of Annex I Parties, but does not provide an exhaustive description. It contains some mention of developments in the observational networks over time and is a status report on the institutions responsible for coordination, number of various types of stations, and other aspects. There is little information on the limitation of these networks, such as lack of complete coverage, or partial automation.

programmes discussed later. Regarding the international research activities, Parties indicated involvement in the International Geosphere-Biosphere Programme (IGBP), the World Climate Research Programme (WCRP) and the International Human Dimensions of Global Environmental Change Programme (IHDP). Parties also mentioned their involvement in other relevant international programmes including the World Weather Watch (WWW), the Global Atmosphere Watch (GAW), the Global Climate Observing System (GCOS), the Global Terrestrial Observing System (GTOS) and the Global Ocean Observing System (GOOS).

9. Activities aimed at promoting regional cooperation in systematic observations were reported by a large number of Parties.[3] Two Parties reported on capacity-building activities directly within their region,[4] whereas others reported participation in regional groupings or regional projects such as the Association of South East Asian Nations (ASEAN), the Pacific Meteorological Services Project, and the South Pacific Regional Environment Programme (SPREP). One Party reported assistance to developing countries via participation in the Valdivia Climate Change Working Group. In addition, other capacity-building assistance to developing countries was identified by some Parties.[5] The assistance included projects for systems of atmospheric soundings, support of meteorological departments and assistance to national meteorological and hydrological services (NMHSs) and national meteorological services (NMSs). The development of the Pacific Climate Assistance Programme (PCAP), approved for funding by the Global Environment Facility, was one such activity.

10. Eight Parties not included in Annex I to the Convention have provided information on observational networks in their first national communications (FCCC/SBI/1999/11).[6] Parties have reported on national meteorological, climate and hydrological networks and monitoring of greenhouse gases and sinks. Three tables are provided in the document referenced above with information on: (a) the types and number of observation stations, national databanks, archiving activities and equipment and institutional arrangements; (b) examples of regional and international cooperation; and (c) activities requiring financial and technical assistance.

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[3] The Parties that have reported information related to regional cooperation include: Australia, Austria, Bulgaria, Canada, Denmark, European Economic Community, Germany, Greece, Italy, Japan, the Netherlands, New Zealand, Portugal, Sweden and the United States of America.

[4] Australia and New Zealand.

[5] Parties reporting information on capacity-building include: Australia, Finland, New Zealand, Norway and the United States of America. It should be noted that reporting on capacity-building activities was not an explicit requirement of the guidelines for reporting on second national communications of Parties included in Annex I to the Convention.

[6] The Parties that have reported information include: Argentina, Armenia, Kazakhstan, the Republic of Korea, Mauritius, Mexico, Uruguay and Zimbabwe.

Information from the World Meteorological Organization and the GCOS secretariat

11. Another source of information regarding the status of observational networks is the monitoring data collected under the World Weather Watch (WWW) of the WMO for surface observations, by the European Centre for Medium-range Weather Forecasts (ECMWF) for upper-air observations and by Météo France for ocean observations. These data sets provide some indication of the performance of critical parts of the meteorological and oceanographic networks.[7] The data provided in tables 1 and 2, representative of recent performance, lend substance to the reports of degradation of observing systems, especially in developing countries. The data represent one piece of information needed to set funding priorities. Additional information from these centres may be available at the eleventh session of the SBSTA.

12. Table 1 provides preliminary information on the status of the GCOS Surface Network (GSN) and GCOS Upper Air Network (GUAN). It shows, by WMO region and globally: in the first column the percentage of "good" stations (i.e. those providing at least 90 per cent of required observations); in the second column, the percentage of "unsatisfactory" stations (i.e. those providing some observations but less than 50 per cent of requirement); and, in the third column, the percentage of "silent" stations (i.e. those providing no data). The table indicates that the worst situation regarding the implementation of the GSN exists in South America and Africa where only 20 and 30 per cent of GSN stations, respectively, provide 90 per cent or more of required observations. About 15 per cent of GSN stations in each of these regions and in the South-West Pacific are considered as "silent".

13. The worst implementation of the GUAN is in South America, where only 40 per cent of stations provide sufficient observations, while about a quarter are completely "silent" or have low implementation (i.e. establishment and continuing operation) levels. The situation is only a little better in Africa, Asia and the South-West Pacific. The reasons for low or non-availability of observational data from these areas include obsolete equipment, lack of qualified staff, and lack of consumables and spare parts due to economic constraints experienced by developing countries in these regions.

Table 1. Preliminary information on the status of meteorological networks, by WMO region

WMO region	Percentage of stations providing at least 90 per cent of observations	Percentage of stations providing less than 50 per cent of observations	Percentage of "silent" stations
	GSN (WWW monitoring, 1-15 October 1998)		
I - Africa	30	18	16
II - Asia	70	7	5
III - South America	20	18	13
IV - North & Central America	77	2	8

[7] Centres have been established by Germany (Deutscher Wetterdienst) and Japan (Meteorological Agency) to monitor the performance of the GSN; by the European Centre for Medium-range Weather Forecasts to monitor the performance of the GUAN; and by the USA (National Climatic Data Centre) to archive the data from these networks.

V - South-West Pacific	75	1	14
VI - Europe	86	0	3
Antarctica	80	5	0
Global	63	7	8
GUAN (ECMWF monitoring, March-April 1999)			
I - Africa	65	9	0
II - Asia	65	8	4
III - South America	40	12	12
IV - North & Central America	75	0	5
V - South- West Pacific	62	3	5
VI - Europe	93	0	0
Antarctica	67	8	0
Global	69	6	4

14. The situation with regard to basic atmospheric/ocean surface variables, by major ocean basin, is indicated in table 2. The data represent the range of daily average percentages of the World Weather Watch (WWW) requirements met for each variable for a recent period; for these data, GCOS requirements are not likely to be much different. Since most of the observations are derived from voluntary observing ships (VOS) and drifting or moored buoys, there is considerable variation even within each ocean basin, and the table reflects this. From an analysis of these and similar results, it is clear that the availability of data from the oceans is far from satisfactory at the present time, though it is relatively stable.[8]

Table 2. **Preliminary information on the status of oceanographic data collected, by ocean basin**

Ocean basin	Surface air pressure (per cent WWW requirements)	Sea surface temperature (per cent WWW requirements)	Surface air temperature (per cent WWW requirements)	Surface wind (per cent WWW requirements)
North Atlantic	50 – 200	50 – 150	20 – 90	20 – 100
South Atlantic	25 – 90	20 – 70	0 – 40	0 – 50
North Pacific	5 – 80	40 – 100	5 – 40	5 – 60
South Pacific	10 (except in limited areas)	20 – 70	0 – 30	0 – 35
Global	5 – 60	10 – 50	0 – 40	0 – 20
Southern	10	0 – 70	0	0 – 50

15. The experience of the agencies participating in the GCOS suggests that non-Annex I Parties have three needs: training and development of their human resources, observing equipment that is consistent with their level of infrastructure, and ongoing funding for supplies and maintenance. The first two of these requirements may be tractable using existing mechanisms such as the Global Environment Facility (GEF) and bilateral aid programmes, but long-term, ongoing operational funding is not ensured by any of the existing financial mechanisms. Funding

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[8] The Ocean Observations Panel for Climate is organizing jointly with the Ocean Object Panel of CLIVAR, OCEANOBS'99, a major international Conference on the Ocean Observing System for Climate in October 1999, with the purpose of defining the optimum mix of measurements needed to meet the goals of climate programmes. It will be hosted by the Government of France with the support of over 20 sponsors. The outcome should be available in time for the eleventh session of the SBSTA.

for such activities has been within the domain of national governments. Given the data presented above on the status of the networks, meeting these needs is clearly still a major problem for the global networks.

B. Intergovernmental processes for addressing the priorities for action

16. The invitation of the COP to consider an intergovernmental process was explored with the relevant agencies at the third session of the Inter-Agency Committee on the Climate Agenda (IACCA) earlier this year. It was determined that existing coordination mechanisms do not focus on all aspects of the climate agenda, while a one-time intergovernmental meeting on systematic observations would only be of limited benefit. Due to the breadth of the climate agenda, no current intergovernmental organization or mechanism encompasses all aspects of a global observing system for climate. Various proposals are being discussed on an appropriate mechanism to establish the priorities for implementing a global observing system for climate and its international coordination. As was noted in the GCOS report to SBSTA 10, they range from a one-time intergovernmental meeting on systematic observations to an intergovernmental board. The former could have only limited impact while the latter requires extensive planning, coordination and development before it could be accepted internationally. Due to the wide range of views on this matter, the GCOS secretariat is working with representatives from a number of interested nations and other organizations to better document a possible process. The next step being considered is a meeting of these representatives in late September 1999 so that a report on a possible process could be presented to the Conference of the Parties at its fifth session.

17. Although meeting the needs of the UNFCCC for systematic observations requires global networks, the experience of the relevant agencies suggests that regional or other sub-global approaches will also be needed to make significant progress towards implementation. Given adequate funding, the GCOS secretariat proposes to hold a series of regional implementation meetings that would identify the specific needs of the Parties or groups of Parties in a given region to address network deficiencies. These needs could be assembled into specific projects and taken to funding agencies such as the GEF. In addition, the meetings would be used to inform Parties about the process of national planning for systematic observations for climate and the requirements for specific regional observations. Building on the experience of the few Parties that have commenced preparation of national climate plans, the meetings would explore the guidance prepared for systematic observations and assist the development of national communications by participating Parties.

18. The Thirteenth World Meteorological Congress (May 1999) noted that the GCOS had now reached "a critical point in its existence due to the serious lack of resources for its implementation. This critical situation had been exacerbated by the need for GCOS to respond to the many urgent requests emanating from ... the Fourth Session of the ... COP ... and the large additional load this had placed on the GCOS secretariat. Congress agreed that the COP Subsidiary Body for Scientific and Technological Advice (SBSTA) should be informed that significant new funds are required both for the Secretariat to discharge this load and for Members to be able to implement the atmospheric and hydrological components of the GCOS plan, and that

a similar situation existed within the oceanographic and terrestrial domains."

19. It is anticipated that further developments relating to intergovernmental processes will be reported by the GCOS secretariat to the eleventh session of the SBSTA.

C. Options for synthesizing national plans and programmes for systematic observation of the climate system

20. Parties that have provided information on observational systems do so using many different formats. The information is generally very diverse, but limited in scope (see the annex to this document). The communications do not include national plans, but sometimes provide summaries of national programmes. Improved guidance for reporting on plans and programmes is needed to encourage Parties included in Annex I to the Convention to provide more uniform and comprehensive information in their national communications. This would subsequently enable more comprehensive syntheses to be undertaken.

21. The GCOS secretariat has provided such draft reporting guidance. It may be found in document FCCC/SBSTA/1999/13/Add.2. If this guidance or a subsequent version is accepted by the Parties, and if Parties use it as a basis for reporting third national communications, it will be possible to develop options for synthesizing information on national plans and programmes in the future. Moreover, if similar reporting guidance were also to be accepted by Parties not included in Annex I to the Convention, it might provide a better basis for ascertaining the technical and financial needs of those Parties.

Annex

Information on research and systematic observation contained in second national communications of Annex I Parties

Annex I Party	Regional cooperation	International cooperation	Capacity-building	Data monitoring, collection and archives
Australia	-Hosts the International Geosphere-Biosphere Programme (IGBP) Global Change and Terrestrial Ecosystems (GCTE) core project office. -Participates in the Regional Interactions of Climate and Ecosystems (RICE) project of the Global Analysis, Interpretation and Modelling (GAIM) programme of IGBP.	-Participates in the World Climate Research Programme (WCRP), including the Arctic Climate System Study (ACSYS) on the impact of climate change on the mass balance of the sub-Antarctic ice sheet and implications for global sea level rise, the Climate Variability and Predictability (CLIVAR), the Stratospheric Processes and their Role in Climate (SPARC), the Global Energy and Water Cycle Experiment (GEWEX) and the World Ocean Circulation Experiment (WOCE) projects. -Participates in the first phase of the Aerosol Characterization experiment comparing aspects of atmospheric aerosols in the northern and southern hemispheres as part of the International Global Atmospheric Chemistry (IGAC) project. -Participates in the study the role of oceans in the global climate system within the Tropical Oceans Global Atmosphere Experiment (TOGA) and the Joint Global Ocean Flux Study (JGOFS).	-Supports regional initiatives like the South-Pacific Sea Level and Climate Monitoring Project, the Association of South East Asian Nations (ASEAN-Australia Maritime Science (Tides) Project) and the Pacific Meteorological Services Project. -Provides technical advice and assistance to neighbouring countries to help improve data management and climate monitoring capabilities of their national meteorological services. -Australian climate models have been made available to Argentina, Indonesia, Japan, New Zealand, South Africa (includes capacity-building). -Provides support for analysis, observation and modelling projects in the Asia-Pacific region as part of the Global Change System for Analysis, Research and Training (START).	Collection and archiving of meteorological data is done primarily by the Bureau of Meteorology. This database was recently upgraded into a modern on-line database system. Data are being collected at 6,200 active rainfall stations, 870 surface observation stations and 60 upper air stations. Surface observation networks are also operated by state and territory agencies and the CSIRO. Stratospheric ozone is monitored regularly at six stations. Trace gas measurements are also carried out. Sea level is monitored. 16 tide gauges are maintained.

Annex I Party	Regional cooperation	International cooperation	Capacity-building	Data monitoring, collection and archives
Austria	-Participates in the Mesoscale Alpine Programme (MAP). -Participates in the International Geosphere-Biosphere Programme. -Participates in the EUROTRAC sub-project ALPTRAC.	-Participates in the international data exchange as part of World Weather Watch (WWW) of WMO. -Participates in the Global Atmosphere Watch (GAW).		It undertakes climate monitoring in the Alps. Also provides locations for monitoring where there is little influence by human activities. Stratospheric ozone monitoring and UV measurements also being conducted.
Bulgaria	-Participates in the European Monitoring of Environment Programme (EMEP).	No information provided regarding participation in international programmes.		The National Institute of Meteorology and Hydrology conducts research on climate oscillation and climate elements over Bulgaria. The Institute of Oceanology is involved in projects related to the observation of the climate characteristics of the Black Sea.
Canada	-Participates jointly with the United States in the Boreal Ecosystem Atmosphere Study (BOREAS).	-Participates in the World Ocean Circulation Experiment (WOCE) and the Joint Global Ocean Flux Study (JGOFS). -Contributes to the Global Energy and Water Cycle Experiment (GEWEX). -Participates in the Global Climate Observing System (GCOS).		A national network of climate observing systems and a comprehensive climate data management system is operational. Concern expressed regarding the potential for deterioration of quality, quantity and accessibility of data due to ongoing rationalization of monitoring activities. The Canadian National Committee for the Global Climate Observing Systems coordinates systematic observations and data collection activities within and adjacent to Canada.

Annex I Party	Regional cooperation	International cooperation	Capacity-building	Data monitoring, collection and archives
Canada (continued)				There is an Acid Rain National Early Warning System and an Ecological Monitoring and Assessment Network. Country monitors greenhouse gas (GHG) concentrations and air chemistry at three long-term stations along the coastlines. National effort is under way to reconstruct the last 20,000 years of country's climate at 1000 year intervals.
Czech Republic		-Participates in the International Geosphere-Biosphere Programme (IGBP), including the Global Change and Terrestrial Ecosystems (GCTE), the Biospheric Aspects of the Hydrological Cycle (BAHC) and Past Global Changes (PAGES). -Participates in the WMO World Climate Programme.		Standard data measured through a network of synoptic and airport stations of the Czech Meteorological Institute. Limited data are provided by the Air Force and the two stations of the Institute of Atmospheric Physics. Specialized observatories include the GEMS Kosetice observatory, the Solar and Ozone Observatory in Hradec and the Prague-Libus observatory (sounding, radar, satellite meteorology). The professional and voluntary stations include 18 synoptic stations, 11 aviation stations, 165 climatological stations, 684 precipitation stations and 10 other professional stations.
Denmark	-Collaborates in the European Climate Support Network (ECSN).	-Participates in the WMO coordinated programmes, the World Weather Watch and the World Climate Data Programme. -Participates in the World Climate Research Programme (WCRP).		Data are contained in the Danish Meteorological Institute (DMI) climate data base. Observations date back to 1872 and sea level observations date back to 1890.

Annex I Party	Regional cooperation	International cooperation	Capacity-building	Data monitoring, collection and archives
Denmark (continued)	-Collaborates with the north-west European meteorological institutes for the North Atlantic Climatological Data Set.			Measurements are also made of solar radiation, sea level at 14 stations, and ozone soundings and ground based spectroscopy in Greenland. DMI coordinated the collection of monthly climatic data, as part of the North Atlantic Climatological Data Set (NACD) involving nine north-west European meteorological institutes. Ozone measurements are also done.
European Economic Community	-Coordinates the Fourth Framework Programme for Research and Development sub-programme on (i) Environment and Climate: research into natural environment, environmental quality and global change (Includes EPICA: European Project on Ice Coring in Antartica). -EURO-CLIVAR feeds into international CLIVAR.	-Supports Large Scale Biosphere-Atmosphere (LBA) experiment in the Amazon. -Participates in the WCRP Climate Variability and Predictability (CLIVAR) programme.		
Finland		-Participates in the Global Atmosphere Watch (GAW) of the WMO.	-Finnish Meteorological Institute is involved in development cooperation in meteorology with African countries and the (see over)	Observations currently made at 3 meteorological observatory stations, 46 synoptic stations, 87 climatological stations and 57 automatic stations.

Annex I Party	Regional cooperation	International cooperation	Capacity-building	Data monitoring, collection and archives
Finland (continued)			Central American isthmus. International development cooperation projects in meteorology include projects for systems for atmospheric soundings (Nicaragua, Costa Rica, Ecuador, Chile, Bangladesh, Myanmar) rehabilitation and improvement of Sudan meteorological department, the NMHSs in Central America and the NMSs in southern Africa.	Finnish climate observations are part of the NACD data set.
France		-Participates in the World Climate Research Programme (WCRP) including the World Ocean Circulation Experiment (WOCE). -Participates in the International Geosphere-Biosphere Programme (IGBP). -Participates in TOGA.		Five national science programmes which include the National Programme for the Study of Climate Dynamics, the Ocean Flux Study, the National Atmospheric Chemistry Programme, the National Coastal Oceanographic Programme and the National Programme "Déterminisme du Recrutement". Additionally there are the National Atmosphere and Ocean Medium Scale Programme, the National Space Remote Sensing Programme and the National Continental Biosphere Programme.
Germany	-Collaborates in the EU projects POLINAT and AERONOX.	-Participates in the WCRP programmes including CLIVAR, GEWEX (Baltic Sea Experiment - BALTEX), WOCE, and ACSYS. -Participates in the IGBP programmes including IGAC, PAGES, GAIM.		The German Weather Service maintains the national climatological archives, including data from more than 550 commercial ships and supports standardization of observation instruments. Measurements also being made by

Annex I Party	Regional cooperation	International cooperation	Capacity-building	Data monitoring, collection and archives
Germany (continued)		-Participates in the GOOS network, the Integrated Global Oceanographic Services System (IGOSS), the GCOS Upper Air Network, WWW and GAW.		the Weather Service of radiation, ozone, atmospheric structure, precipitation and clouds. Oceanographic monitoring is being done within the Integrated Global Oceanographic Services System (IGOSS) and the International Oceanographic Data and Information Exchange (IODE) programmes. The German Federal Institute for Navigation and Hydrography maintains a network of oceanographic measurement stations in the German Bight and the Western Baltic. The Marine Environment Remote-Controlled Measuring and Integrated Detection (MERMAID) system is being integrated into this network. Monitoring of CO_2 concentrations at five background measuring stations since 1972. CH_4, N_2O, VOC also monitored.
Greece	-Participates in the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) and the European Centre for Medium Range Weather Forecasting (ECMWF).	-Participates in the World Weather Watch, the WCRP including the World Climate Programme, the GCOS and the IGBP.		

Annex I Party	Regional cooperation	International cooperation	Capacity-building	Data monitoring, collection and archives
Ireland		-Participates in the IGBP.		14 synoptic observing stations operational under the Irish Meteorological Service. Programme to install automatic weather stations to ensure full daily coverage is under way. 80 climatological stations make measurements of rainfall, temperature, and occasionally sunshine, soil and earth temperatures, and weather phenomena. These data are supplied by the organizations and individuals operating these stations to the Irish Meteorological Service where they are checked for quality and then archived. Ozone measurements are also being made at one observatory and UV radiation is being measured at three locations.
Iceland		-Participates in the IGBP (GCTE and the Biospheric Aspects of the Hydrological Cycle), the IHDP and the WCRP. -Contributes to the International Tundra Experiment (ITEX) network.		The Icelandic Meteorological Office collects information from 130 locations. Extensive measurements of ozone and other measurements of greenhouse gases have been conducted.
Italy	-Participates within the EU framework. No details available.	-Participates in the World Data Centre for Greenhouse Gases, of the WMO.		Two stations at Monte Cimone and Lampedusa monitor CO_2, CH_4, N_2O and chlorofluorocarbons (CFCs). Daily ozone monitoring also occurs.

Annex I Party	Regional cooperation	International cooperation	Capacity-building	Data monitoring, collection and archives
Japan	-Cooperates within the Asia-Pacific Network for Global Change Research (APN).	-Participates in the WCRP, the IHDP and the IGBP. -Participates in the GEWEX Asian Monsoon Experiment (GAME), the IOC Sub-commission for the Western Pacific (WESTPAC). -Participates in the Global Environmental Monitoring System (GEMS), the Global Atmosphere Watch (GAW), the GCOS, the GOOS, and the Integrated Global Ocean Services System (IGOSS) and the Committee on Earth Observation Satellites (CEOS).		Additional to the measurements of air temperature, water temperature, atmospheric pressure, precipitation, direct solar radiation, national efforts to measure temporal and spatial distribution of CO_2, CH_4, CFCs, N_2O, tropospheric ozone, and other GHGs are being reinforced. Use of satellite sensors is also being actively promoted.
Latvia		-Participates in the WCRP (World Climate Data and Monitoring Programme), the Hydrology and Water Resources Programme and the Global Atmosphere Watch (GAW).		Climate measurements are carried out by the Latvian Hydrometeorological Agency. Ozone measurements are being conducted at the Rucava station.
Lithuania		-First national communication indicates it participates in the UNESCO Man and the Biosphere Programme.		

Annex I Party	Regional cooperation	International cooperation	Capacity-building	Data monitoring, collection and archives
Netherlands	-Participates in the earth observation programmes of the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) and the European Space Agency (ESA).	-Participates in the WCRP, the IGBP and the International Human Dimensions of Global Environmental Change Programme (IHDP). -Participates in the Global Climate Observing System (GCOS), Global Terrestrial Observing System (GTOS) and the Global Ocean Observing System (GOOS).		The Royal Netherlands Meteorological Institute (KNMI) stores and manages the climate data collected at various monitoring stations. At present there are 400 observation stations and around 370 weather variables are collected. A database on climate includes what is collected via the observation stations. Meteorological observations date back to 1850-1900 depending on the variable.
New Zealand	-Collaborates with the CSIRO Division of Atmospheric Research Australia. -Collaborates within the Southern Alps Experiment (SALPEX).	-Participates in the International Geosphere-Biosphere Programme (IGBP). -Participates in the World Climate Research Programme (WCRP), including CLIVAR project. -Participates in the GEWEX Cloud System Study (GCSS). -Participates in the first aerosol characterization experiment(ACE-1) of the International Global Atmospheric Chemistry Project, investigating the relationship between cloud condensation nuclei and dimethyl sulphide in the South Tasman Sea.	-Collaborates with appropriate individuals of the Pacific island countries through the South Pacific Regional Environment Programme (SPREP). -Country scientists assisted in development of the Pacific Climate Change Assistance Programme (PCAP), approved for funding by the GEF. -Cooperates with Bangladesh experts working on sea level rise. -Develops plans for collaborative research and capacity-building within several southern hemisphere developing countries through the Valdivia Climate Change Working Group (Argentina, Australia, Chile, New Zealand, South Africa, Uruguay).	Climate and weather observation from New Zealand and the South Pacific islands are achieved by the National Institute of Water and Atmospheric Research (NIWA) in a database. The archive includes data from 21-station New Zealand reference climate network. Sea surface temperatures are also monitored by NIWA, using *in-situ* temperature recorders and satellites. NIWA also measures concentrations of CO_2, CH_4, and CO, apart from stratospheric ozone and UV radiation. The Navy Hydrographic Office holds 90-year tide gauge records from various locations. NIWA also operates approximately 300 river flow and lake level measuring sites.

Annex I Party	Regional cooperation	International cooperation	Capacity-building	Data monitoring, collection and archives
Norway		-Participates in the International Tundra Experiment (ITEX). -Participates in the IGBP, and the Biospheric Aspects of the Hydrological Cycle (BAHC). -Hosts the international core project office of the Joint Global Ocean Flux Studies (JGOFS) and the International Arctic Climate System Study office (ACSYS). -Participates in the International Global Atmospheric Chemistry Project (IGAC), and the Global Change and Terrestrial Ecosystems (GCTE) research.	-Funds made available for Norwegian scientists involved in collaboration with developing countries.	The Norwegian Institute of Air Research (NILU) is responsible for GHG observations. Tropospheric and stratospheric ozone and CO_2, CH_4, N_2O, and CFCs are measured at the Arctic atmospheric baseline station. Also contributes to the NACD data set. A pre-1990 meteorological database has also been developed in Stavanger. Temperature and salinity records are maintained on the weather ship Polarfront.
Portugal	-Participates in the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) and the European Centre for Medium Range Weather Forecasting (ECMWF).	-Participates in the WMO, the WWW, the WCRP and the GCOS.		The Institute of Meteorology is responsible for the maintenance of 30 synoptic stations, 70 climatological stations, 700 udometric units and 3 aerological stations. Future purchase and installation of automatic weather stations is likely.
Russian Federation		-Participates in the Global Energy and Water Cycle Experiment (GEWEX), the Tropical Ocean and Global Atmosphere Programme (TOGA), the World Ocean Circulation Experiment (WOCE), the Climate Variability		Roshydromet is responsible for climate change monitoring. Data on air temperature, precipitation and atmospheric circulation, cloud cover and sea surface temperature are collected. Since 1985, a bulletin on climate monitoring has been issued.

Annex I Party	Regional cooperation	International cooperation	Capacity-building	Data monitoring, collection and archives
Russian Federation (continued)		and Predictability experiment (CLIVAR) and the Arctic Climate System Study (ACSYS).		
Spain	-Participates in the EU Fourth Framework Programme for Research and Development.	-Participates in the IGBP, the IHDP and the WCP.		The National Institute of Meteorology is responsible for atmospheric observations. There are both manned and automatic observing stations measuring various surface and upper air measurements. Terrestrial and oceanic measurements are also being made.
Sweden	-Participates in the EU project SINDICATE (Study of the Indirect and Direct Influences on Climate of Anthropogenic Trace Gas Emissions). -Participates in the Nordic Climate Modelling Project (NOCLIMP) studying the sensitivity of large GCMs to moisture-cloud-radiation processes.	-Participates in the Joint Global Ocean Flux Study (JGOFS). -Participates in the IGBP, the GCTE on ecosystem physiology for boreal forests and in PAGES on climatic changes in the past 20,000 years. -Participates in the WCRP within the Global Energy and Water Cycle Experiment (GEWEX) in particular on BALTEX, the Baltic Sea Experiment; the Climate Predictability and Variability (CLIVAR) and the World Ocean Circulation Experiment (WOCE).		

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Switzerland		- Hosts the core project office of the International Geosphere-Biosphere Programme, Past Global Changes project. - Contributes to the WCRP, the IHDP, the GCTE, and DIVERSITAS Programme.		Monitoring activities are supported by Federal and Cantonal administrations and research institutions. The observational network are considered to be well developed and include measurements of the variables including atmospheric concentrations of trace gases, aerosols, particulates, direct, diffuse, terrestrial and global irradiance, UV radiation and snow cover conditions.
United Kingdom of Great Britain and Northern Ireland		- Participates in the WCRP and the IGBP. - Participates in the global observing systems GCOS, GOOS and GTOS.		Climate monitoring is undertaken by the Meteorological Office. Global average surface temperatures are published annually and also a historic sea-surface temperature data set has been published. Sea level is monitored. The concentrations of greenhouse gases are also monitored. Changes to flora, fauna, soil, water, and air composition are monitored by the Environmental Change Network.